

Space Weather Forecast

Issued on Thursday, 25 May 2023 at 13:26 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: R1/R2 radio blackouts Likely. Slight chance of G1/Minor geomagnetic storm intervals to end current UTC working week.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been moderate over the last 24 hours, with occasional common-class X-ray flares and peak activity at moderate-class in an isolated large flare from the largest and most complex group on the Sun at 24/1721UTC. There are currently up to seven sunspot groups on the Sun, with the aforementioned large spot now partitioned into two groups. A similar process may also be occurring with another spot group in the southwest of the Sun.

Of the current sunspots, one in the southeast has developed rapidly in the period, with its constituent spots growing larger and spreading making this one to watch. A region nearer the solar meridian appears to be a relatively minor region in visible light, however there is some arcing visible in extreme UV light between this region and a larger group to its west that may help explain some Common-class X-ray activity in the former. This larger spot group that it was connecting to showed relatively minor changes in the past day, with some small spots mobile around the main large spot.

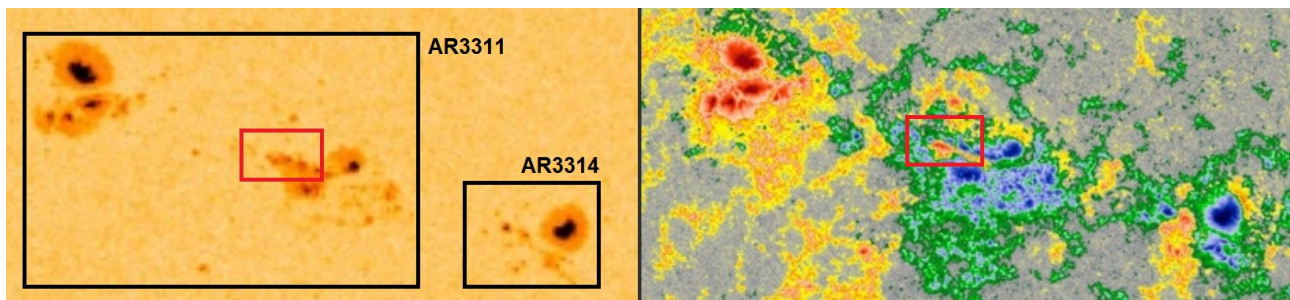


Figure 1: Visible and magnetic polarity imagery from 25/1200UTC, showing the largest and most complex sunspot group (numbered AR3311) and a leading portion, now assigned as AR3314. The region boxed in red is a possible Mt Wilson ‘delta spot’, whereby one penumbra (orange in visible image) contains two umbrae (black ‘spots’) of opposing magnetic polarity. This arrangement can be particularly unstable and is a main source for monitoring. This feature has weakened in definition in the past 24 hours – and has been matched by lessening X-ray activity at the time of writing.

No Earth-directed Coronal Mass Ejections (CMEs) were observed in available satellite imagery. Disappearing ‘filaments’ (arcs of plasma) from the northwest around 24/1200UTC and the southwest around 25/1030UTC do not yet show evidence of CMEs, and they may have been re-absorbed. A CME visible from around 25/0900UTC, apparently heading south and west of the track of the Earth in its orbit appears to be far-sided from cursory analysis, with no effect expected at Earth.

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Solar Wind / Geomagnetic Activity: Solar winds have shown a fast wind regime, likely to be that from a large coronal hole on the southwest of the Sun. Solar wind speeds have shown a slight upward tendency through elevated levels, as the number of particles and their associated magnetic field have both remained steady and at background levels.

The net result of the above solar wind measures was below Minor Geomagnetic Storm G1 throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is Likely to remain moderate, with isolated to occasional Moderate-class X-ray flares likely and a slight chance of Strong-class flares. These flares are most likely from the largest and most complex group, or perhaps the quickly-developing southeastern active region. No sunspot groups leave the disc in the four days, and while there are suggestions of arrivals, these have yet to present for analysis over the eastern solar horizon, and the risks are therefore held constant throughout.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs expected, although a weak CME may give some glancing influence on Days 2 or 3 (26 or 27 May).

Solar winds expected to remain at elevated levels during Day 1 (25 May) due to the continued influence of the currently observed fast solar wind. Wind speeds are forecast to decline steadily from Day 2 (26 May) onwards towards background levels, although any decline may be temporarily inhibited by any possible CME glance.

Geomagnetic activity is forecast to most likely remain below Minor Storm G1, with the slight chance of this occurring reducing with time to leave more reliably quiet conditions from later in the UTC weekend.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, however there is a slight chance of reaching the S1/Minor Storm threshold should any larger flares occur.

Geomagnetic Storms:

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	10	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	60	60	60	60
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	10	10	15	15
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)